

PATENT  
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ABSTRACT OF THE DISCLOSURE

[0045] In one embodiment of the present inventions, an exhaust outlet in a vacuum processing chamber includes a nonsealing flow restrictor which can facilitate rapid opening and closing of the flow restrictor in some applications. Because the flow restrictor is a nonsealing flow restrictor, the conductance of the flow restrictor in the closed position may not be zero. However, the flow restrictor can restrict the flow of an exhaust gas from the chamber to permit the retention of sufficient processing gas in the chamber to deposit a film on the substrate or otherwise react with the substrate. After a film has been deposited, typically in a thin atomic layer, the exhaust flow restrictor may be opened such that the flow restrictor conductance is significantly increased to a second, higher flow rate to facilitate exhausting residue gas from the chamber. The nonsealing flow restrictor may be closed again to deposit a second layer, typically of a different material onto the substrate. The nonsealing flow restrictor may be rapidly opened and closed to deposit alternating layers of a variety of materials onto the substrate.